Sedimentary Rocks

Deposited on or Near Surface of Earth by Mechanical or Chemical Processes

What Rocks Tell Us

Rock Type	How Classified	What it Tells Us
Igneous	Composition	Tectonic Setting
	Texture	Cooling History
Sedimentary	Chemical Composition	Surface Environment
	Grain Size	Energy of Environment
Metamorphic	Composition	Original Rock Type
	Mineral Makeup	Temperature, Pressure
	Texture	Degree of Change

Sedimentary Rocks are the Principal Repository for Information About the Earth's Past Environment

Environmental Clues in Sedimentary Rocks

- Grain Size - Power of Transport Medium
- Grading - Often Due to Floods
- Rounding
- Sorting

} Transport, Reworking

- Cross-bedding - Wind, Wave or Current Action

Environmental Clues in Sedimentary Rocks

- Fossils
  - Salt Water - Corals, Echinoderms
  - Fresh Water - Insects, Amphibians
  - Terrestrial - Leaves, Land Animals
- Color And Chemistry
  - Red Beds - Often Terrestrial
  - Black Shale - Oxygen Poor, Often Deep Water
  - Evaporites – Arid Climates

Bedding or Stratification

- Almost Always Present in Sedimentary Rocks
- Originally Horizontal
- Tilting by Earth Forces Later
- Variations in Conditions of Deposition
- Size of Beds (Thickness)
  - Usually 1-100 Cm
  - Can Range From Microscopic to 50m

Sedimentary Rocks

Clastic Rocks

- Made of Fragmentary Material
- Deposited by
  - Water (Most Common)
  - Wind
  - Glacial Action
  - Gravity

Biochemical Sedimentary Rocks

- Evaporation
- Precipitation
- Biogenic Sediments

Clastic Rocks

Classified by:

- Grain Size
- Grain Composition
- Texture

Sediment Sizes and Clastic Rock Types

Rock Type	Sediment	Grain Size
Shale	**Clay**	**less than 0.001 mm**
Siltstone	**Silt**	**.001-0.1 mm**
Sandstone	**Sand**	**.01-1 mm**
Conglomerate	**Gravel**	**1mm +**

Sedimentary rocks made of silt- and clay-sized particles are collectively called *mudrocks*, and are the most abundant sedimentary rocks.

Some Special Clastic Rock Types

- Arkose — Feldspar-Rich
- Breccia — Angular Fragments
- Graywacke — Angular, Immature Sandstone

Maturity

- Stability of Minerals
- Rock Fragments
- Rounding or Angularity
- Sorting

Removal of Unstable Ingredients - Mechanical Working

Diagenesis


Shoe
DO YOU STILL HAVE THAT SPECIAL SECTION WE PUT OUT IN 1976 FOR THE BICENTENNIAL?
SURE.
CAN YOU DIG IT OUT OF THERE?
PROB'LY NOT.
BECAUSE OF YEARS OF PRESSURE, ANYTHING THAT'S BEEN ON MY DESK OVER 10 YEARS HAS TURNED TO SHALE.

Diagenesis

Compaction

Cementing

- Quartz
- Calcite
- Iron Oxide
- Clay
- Glauconite
- Feldspar

Alteration

- Limestone - Dolomite
- Plagioclase – Albite

Recrystallization

- Limestone

Chemical Sediments

Evaporites -Water Soluble

- Halite
- Gypsum
- Calcite

Precipitates

Example: Ca(sol'n) + SO_4 (Sol'n) = $CaSO_4$

- Gypsum
- Limestone
- Iron Formations

Alteration After Deposition

- Dolomite

Biogenic Sediments

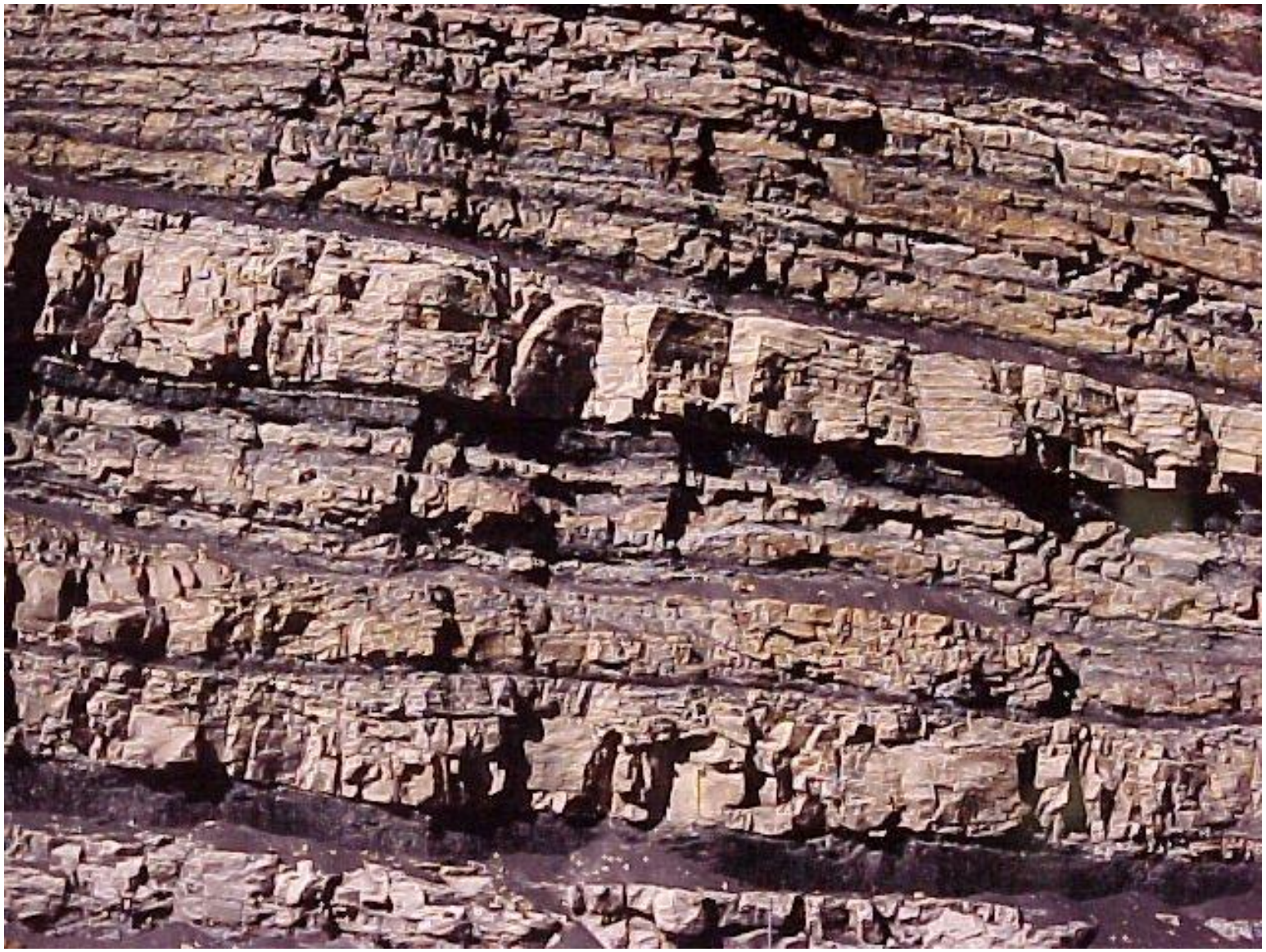
- Limestone - Shells, Reefs, Etc.

Organic Remains

- Coal
- Petroleum

Fossil Fuels

Coal Seams, Utah



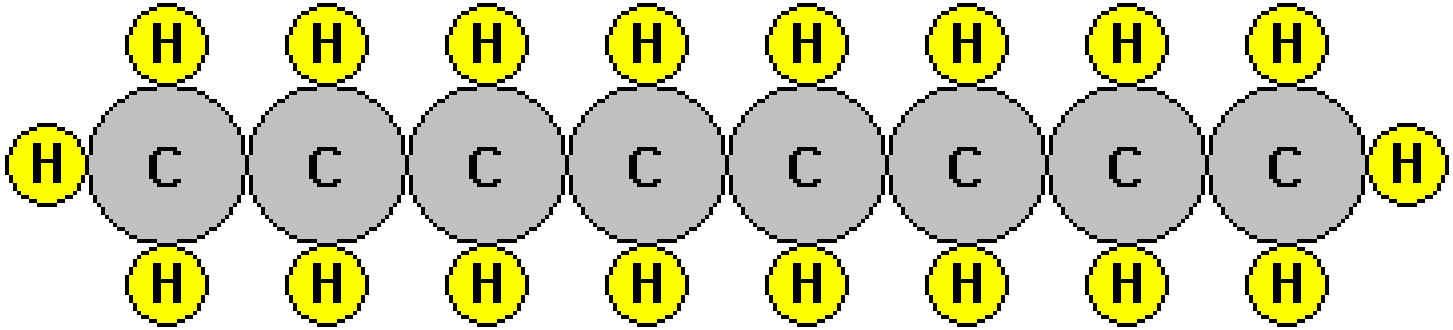
Coal

- Delta, continental environments
- Carbonized Woody Material
- Often fossilized trees, leaves present

Plant Fragments Are Often Visible in Coal

Petroleum

A hydrocarbon molecule

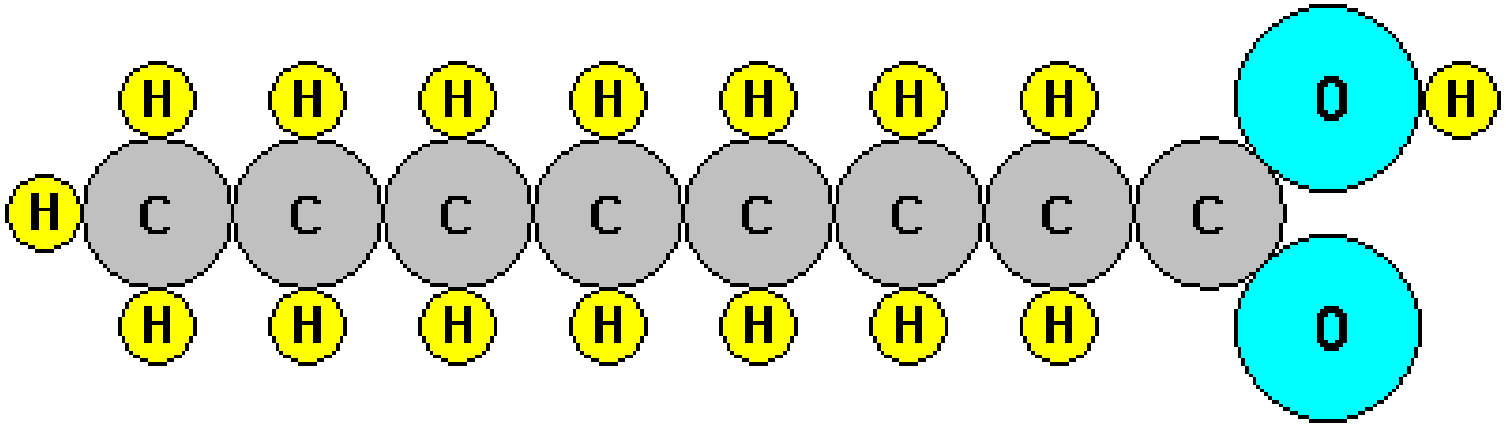


What organisms make these?

Answer: None

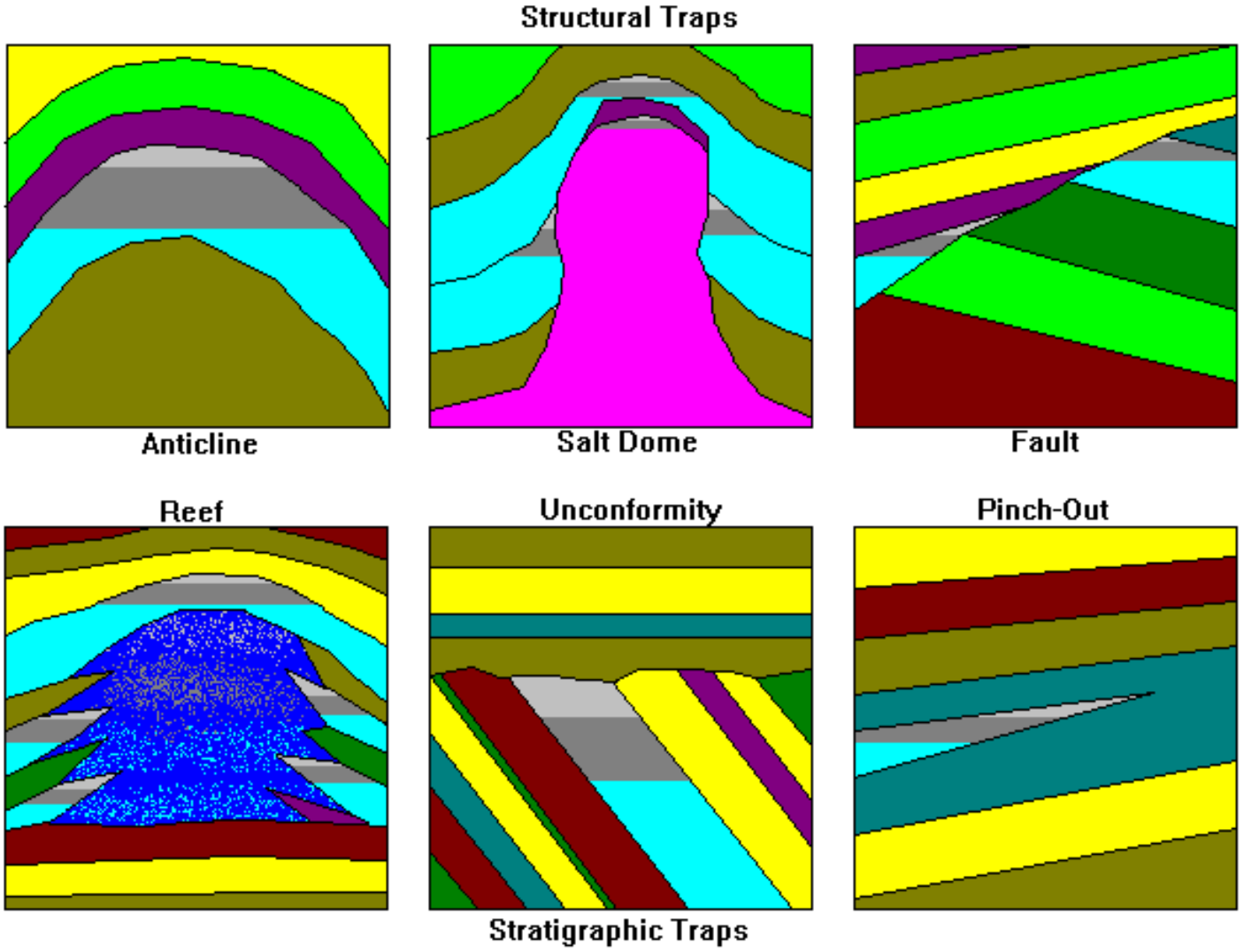
Petroleum

- Lots of organisms make these, however

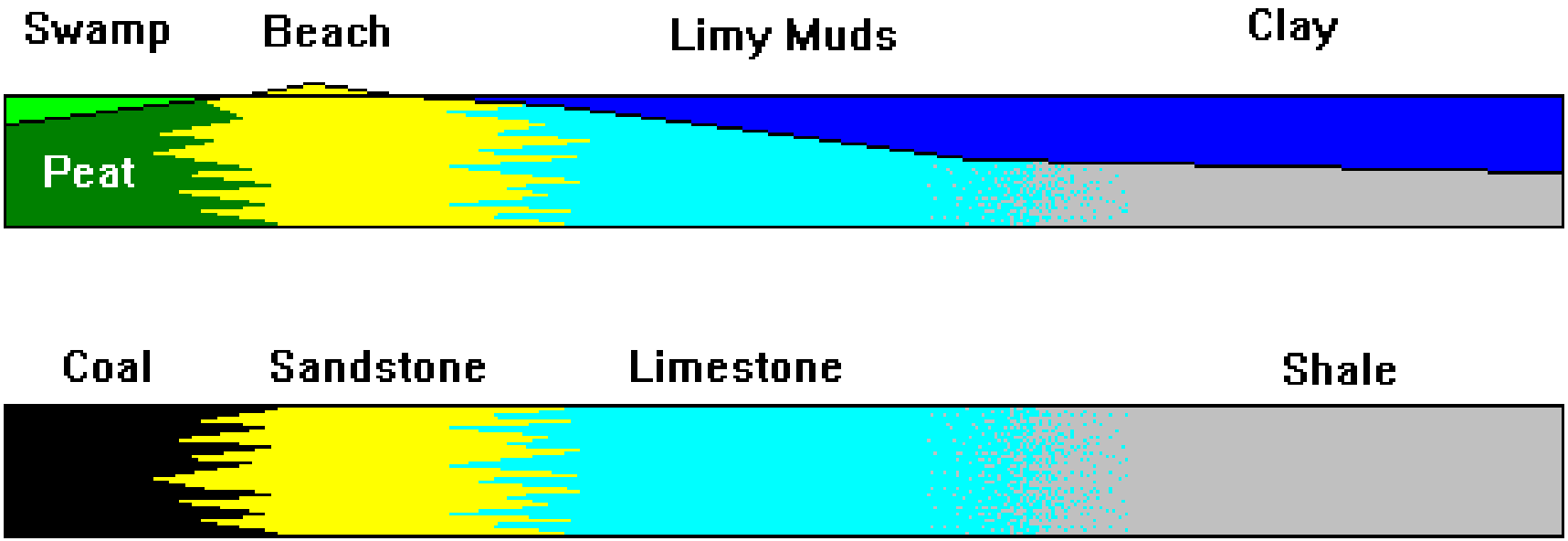


- Fatty Acids
- Probable source: Marine plankton

Petroleum Traps



Facies Changes



Landforms Associated with Sedimentary Rocks

Mesa

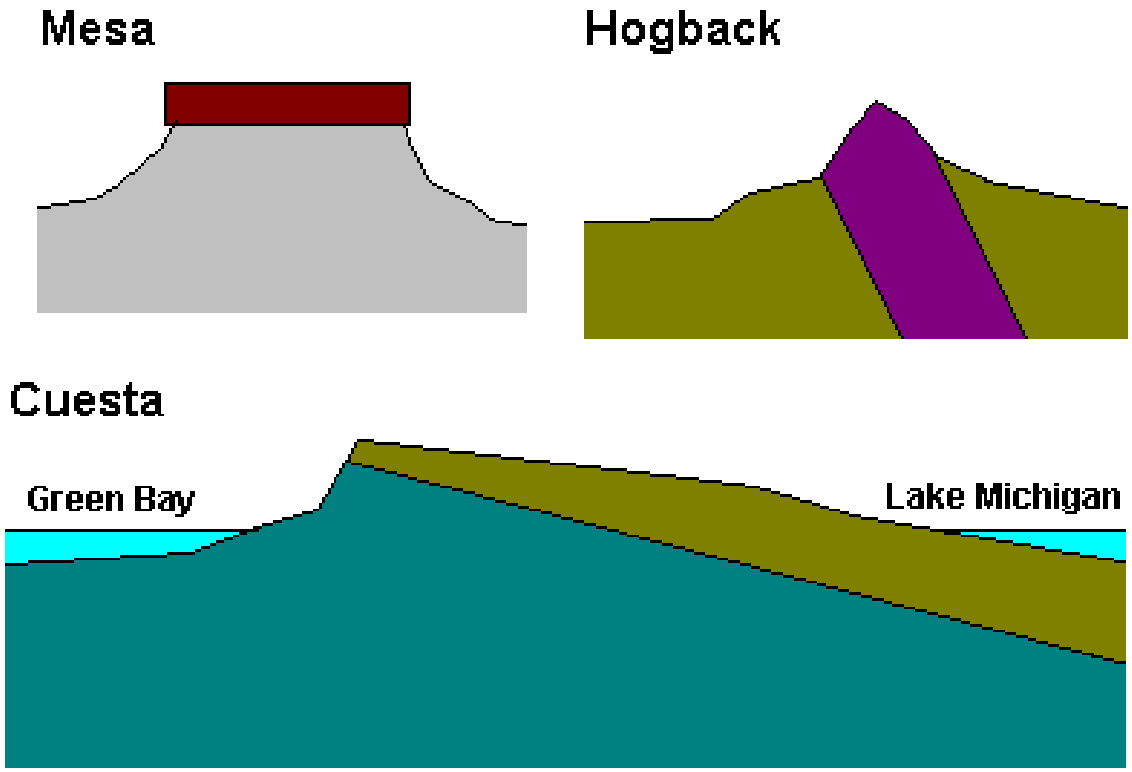
- Flat-topped hill capped with hard rock

Cuesta

- Gently-tilted layer of hard rock: Door Peninsula
- The gentle upper slope, on top of the layer is called the *dip slope*

Hogback

- A sharp ridge of hard rock, edge of a steeply-dipping layer



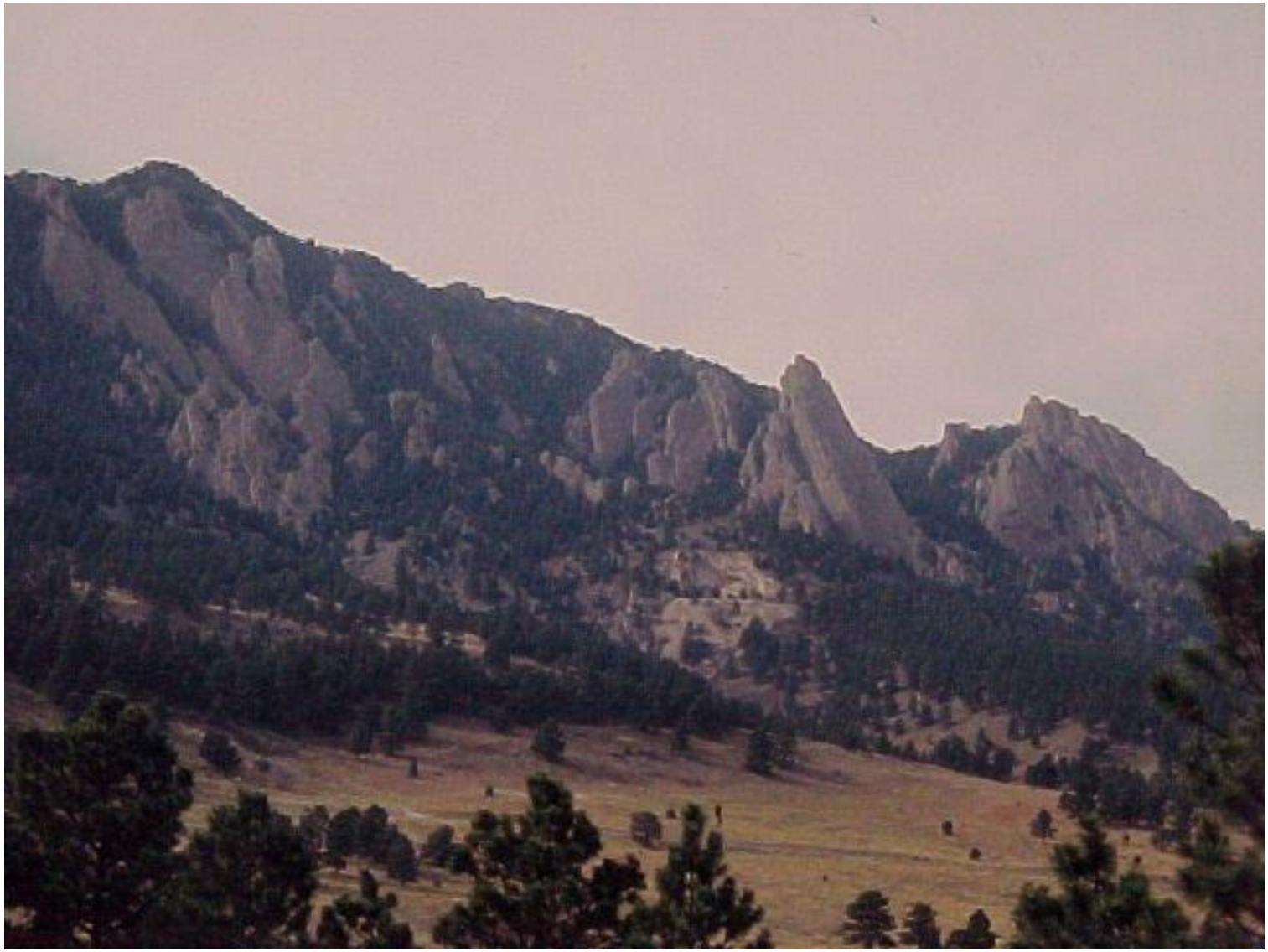
Mesas, Utah

Grandfather Bluff, Wisconsin

Cuestas, Wyoming

A Hogback, Wyoming

Flatirons, Boulder, Colorado



Garden of the Gods, Colorado